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ABSTRACT

This study developed new national estimates of morbidity costs and examined trends in disability and labor-force participation for the noninstitutionalized population of males aged 17 to 64. Based on 1974-1978 data from the Health Interview Survey, the study found 2.7 million working-age males unable to work, 5.4 million working-age males with chronic health problems, and 272 million work days lost annually during 1974-1978. The annual morbidity cost was estimated to be $51.9 billion (in 1975 dollars) when education, occupation and industry were held constant, and $64 billion when these factors were not held constant. Debility costs, a component often omitted in previous studies, accounted for 24.4 and 30 percent of these totals. Cost estimates for 61 specific health problem categories were derived. Descriptive analysis of trends for the 1969-1980 period showed a correlation between increases in reported disability and declines in labor-force participation rates for the 45-54 and 55-64 age groups, but the magnitude of the disability increase was not large enough to fully explain the labor-force participation decline. (Author/AA)

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Morbidity Costs: National Estimates and Economic Determinants

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Abstract

The study develops new national estimates of morbidity costs and examines trends in disability and labor-force participation for the noninstitutionalized population of males aged 17 to 64. Based on 1974-78 data from the Health Interview Survey, the annual morbidity cost is estimated to be $51.9 billion (in 1975 dollars) when education, occupation and industry are held constant, and $64 billion when these factors are not held constant. Debility costs, a component often omitted in previous studies, accounts for 24.4 and 30 percent of these totals. Cost estimates for 61 specific health problem categories are derived. Descriptive analysis of trends for the 1969-80 period shows a correlation between increases in reported disability and declines in labor-force participation rates for the 45-54 and 55-64 age groups, but the magnitude of the disability increase is not large enough to fully explain the labor force participation decline.

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Morbidity Costs: National Estimates and Economic Determinants

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and Health Care Technology Assessment

Foreword

This state-of-the-art analysis, by one of the nation's foremost health economists, estimates the extent and costs of morbidity. Dr. Salkever finds about 2.7 million working-age males unable to work, 5.4 million working-age males with chronic health problems, and 272 million work days lost annually during 1974-78. The total morbidity costs (1975) were estimated at more than $50 billion. Back problems were the leading condition in preventing or limiting work activities, while injuries and respiratory ailments accounted for half of the work-loss days. The findings of this research uncover the extent and composition of illness and disease which prevent or limit work activities on a permanent (chronic debility) or temporary (sick days) basis. The results will be helpful in focusing further research directions and public policies for the prevention and treatment of morbid conditions afflicting the work force.

John E. Marshall, Ph.D.
Director

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With the growing prominence of economic concerns in health policy discussions, increasing attention has been paid to the economic costs of illness. Costs-of-illness (COI) estimates are seen as potentially useful in formulating policy. Expert assessments of policies for confronting major health problems now routinely include consideration of illness costs.

As COI estimates have gained wider significance, concerns about methods used to develop these estimates have also grown. It has been noted that differences in methods among studies have produced large differences in cost estimates for the same health problems. To promote a standardization of methods, and thereby enhance the utility of COI studies for priority setting, a U.S. Public Health Service task force recently promulgated a set of methodological guidelines. Further changes and refinements in methods will continue to occur. Major new approaches, such as the incidence or lifetime-costing method, have only recently appeared in the literature. Important conceptual and practical issues, relating to such matters as the valuation of nonmarket work and the use of consumer valuations (*i.e.* willingness-to-pay within a given budget constraint) for reduced health risks, are still items of debate in the literature.

Recent research has raised substantive questions about the determinants of illness costs. The judicious interpretation and use of illness cost estimates requires some understanding of the factors which determine the magnitude of these costs. Evidence from many studies suggests that social and economic forces have an important influence on the incidence and prevalence of health problems. More recent research, however, indicates that economic factors also play a critical role in determining the indirect morbidity costs of these problems. In particular, these studies imply that the effects of health problems on individual labor supply and on the severity of self-reported work limitations due to poor health are strongly related to economic factors; thus, these factors become major determinants of the magnitude of indirect morbidity costs of illness.

The research presented in this report addresses both methodological and substantive concerns relating to morbidity costs for noninstitutionalized adult working-age males, and provides new national cost estimates based on several alternative computational procedures. The methods used to develop these estimates differ from previous studies in several respects: (1) a more detailed classification of health problems was employed; (2) estimates of debility costs (one component of morbidity costs) are more complete; (3) information on education, residence, industry and occupation are incorporated into the estimation process; and (4) the impact on estimated costs of controlling for education, industry and occupational characteristics is examined.

The concluding chapter of the report is a descriptive analysis of trends in disability and labor-force participation for adult working-age males. It addresses several substantive issues raised by recent empirical research including the hypothesis that the decline in male labor force participation and the increase in reported disability are both largely explained by more liberal disability benefit programs and other economic factors.

Morbidity cost estimates: data and methods

The estimates developed in this study are for morbidity costs of noninstitutionalized males age 17 to 64 in the United States over the period 1974-1978. Three components of morbidity costs are estimated: earnings losses of persons unable to work, costs of work-loss days and debility costs (*i.e.* earnings reductions, for people who work, caused by long-term health problems). Two sets of tasks were involved in the estimation process. First, numbers of persons unable to work, numbers of work-loss days and numbers of working persons with long-term health problems had to be estimated in total and for specific problem categories. Second, earnings or productivity losses had to be estimated for each person unable to work, each work-loss day and each working person with a long-term health problem, and aggregated to obtain total morbidity costs and costs for each problem category.

The data set employed for the first set of tasks was the Health Interview Survey (HIS) for the years 1974-1978. Individuals reporting themselves as unable to work because of a chronic health problem were identified on the HIS data tapes and the sum of their survey weights was used to obtain a national estimate of their numbers. These individuals were then arranged by the diagnostic code of the problem which was the primary cause of their inability to work, and were grouped into 61 problem categories based on diagnostic codes shown in Table 1.

Numbers of work-loss days were reported by the HIS survey respondents and the survey weights were applied to obtain national estimates. The same 61 problem categories were used for grouping although this resulted in a somewhat uneven distribution of work-loss days across groups. Moreover, diagnostic codes are generally reported on the HIS only for work-loss days due to chronic conditions which are reported by the respondent as causing some activity limitation. Therefore, about 20 percent of all work-loss days could not be assigned to one of the 61 problem categories and were treated as a residual group.

All individuals who worked at all during the year and who suffered from long-term health problems should be included in an estimate of annual debility costs. Since the HIS data did not include information on work status for a 12-month recall period, a proxy indicator of whether or not someone worked at all in the

past 12 months was used. More specifically, a respondent was presumed to have worked if he indicated that (1) working was his usual activity, (2) he had worked at all in the two weeks preceding the survey interview, or (3) he currently had a job.

Estimation of dollar values of earnings or productivity losses required use of the 1976 Survey of Income and Education (SIE), since the HIS did not provide information on earnings or wage rates. For persons in the HIS reporting themselves as unable to work, these losses are equal to the income which we estimate they would have earned if they had not had a long-term health problem. This income figure was computed as the average earnings in 1975 by persons in the SIE data, without chronic health problems, classified by age group, education level, race and region of residence. The productivity loss for each work-loss day reported in the HIS was based on a synthetic estimate of the respondent's hourly wage. This estimate was computed by inserting data on their personal characteristics into an hourly wage regression equation estimated with SIE data, and obtaining the predicted wage value based on the regression coefficients. Independent variables used in the regression pertained to age, education, race, presence or absence of a chronic health condition, region and urban or rural character of residence, industry where the person was employed and average earnings for the occupation in which the person was employed.

For persons experiencing debility costs, earnings loss measure is the difference between the income which they could have earned if they had been free of health problems and the income which they actually earned. Of course, neither of these income figures are on the HIS data, so synthetic regression estimates were again developed from the SIE data. The dependent variable in these regressions was annual earnings and the independent variables were similar to those used in the wage regression. Two regressions were estimated, one from data on persons reporting chronic health limitations and a second from data on persons without such limitations.

Finally, alternative sets of earnings loss estimates for persons unable to work and for debility costs were developed; in these estimates variables such as education, occupation and industry were not used. Since these variables might themselves be affected by long-term health problems, their use in estimating earnings losses could understate the impacts of these problems. Our alternative set of estimates served to indicate the possible extent of understatement due to the inclusion of these variables. An alternative hourly wage regression for valuing work-loss days was not estimated. Work-loss days represent short-term departures from regular working schedules because of acute illnesses or acute episodes of chronic problems; it is unlikely that acute illnesses or episodes *per se* would impact on an individual's education, occupation, or industry, so the potential understatement alluded to above was not viewed as a serious problem in relation to work-loss days.

Results for frequency estimates

We estimate that in an average year among noninstitutionalized males age 17 to 64, 2.7 million persons were unable to work because of long-term health problems, 272 million work-loss days occurred and 5.4 million persons who worked had long-term health problems that limited their activities (Table 2). Among the 61 problem categories, only six account for 100,000 or more persons unable to work: orthopedic impairments of the back and neck (Group 10), ill-defined heart trouble (Group 36), chronic ischemic heart disease (Group 30), emphysema (Group 46), nonspecific, nontraumatic arthritis (Group 56) and disc problems (Group 57). The two relating to back problems, Groups 10 and 57, are also first and third, respectively, in importance as causes of limitations among persons who work. The two groups which are the most frequent reasons for inability to work (Groups 56 and 30) are important causes of limitations among persons who worked. Two other categories, orthopedic impairments (Group 13) and deformities (Group 15), are frequent causes of limitations for working persons, but are less important as reasons for inability to work.

The frequency distribution of work-loss days among the categories was very different and more uneven. Two categories, injuries (Group 60) and other respiratory diseases (Group 47), accounted for nearly one-half of all work-loss days. Furthermore, about 20 percent of work-loss days could not be linked to a specific condition. Among the remaining groups, only infective and parasitic diseases (Group 16) accounted for more than 10,000 work-loss days.

Cost estimates

Two estimates for each of the three components of morbidity costs under study were obtained; the first set of estimates controlled for education, occupation and industry while the second set of estimates did not control for these factors. The first set of estimates (Table 3) yields a total morbidity cost figure of $51.9 billion (in 1975 dollars). More than half of this total consists of earnings losses for persons unable to work ($28.1 billion), while the costs of work-loss days are only $11.0 billion. (A comparable earnings loss figure for both males and females unable to work in 1977, from another recent study based on U.S. Department of Labor prevalence data, was only $23 billion.) Debility costs, which have been omitted from most previous national estimates, are estimated here at $12.7 billion, or approximately 25 percent of our $51.9 billion total.

Turning to the results for the individual problem categories, we observe that only seven categories account for more than $2 billion each in morbidity costs. Three of

these—other respiratory diseases (47), injuries (60) and the residual missing data category (62)—are primarily responsible for large costs of work-loss days. The remaining four—orthopedic impairments of the neck and back (10), chronic ischemic heart disease (30), nonspecific, nontraumatic arthritis (56) and disc problems (57)—are primarily responsible for costs due to inability to work and debility costs. All seven of these high-cost categories showed high frequencies of health problems, as noted above. In our estimates, frequency is more important than average cost per person or per work-loss day in determining the significance of a problem category, since the inter-category variation in the average cost figure is small.

Our second set of estimates shows that allowing for health problem impacts on education, industry and occupation of persons unable to work and persons with debility costs results in substantial increases in estimated morbidity costs. Costs for persons unable to work rose from $28.1 billion to $33.1 billion; the corresponding increase for debility costs is from $12.7 billion to $19.9 billion. With these revised estimates, the seven highest-cost categories noted above are still the most important; however, two additional categories (13 and 36) have costs in excess of $2 billion with the revised estimates.

A further analysis of the differences between the two sets of estimates indicates that differences in occupation and education between persons with and without long-term health problems account for the larger size of the revised estimates because these estimates attribute all of the educational and occupational differences to the impact of health problems. In some cases, where the onset of a problem occurs early in life (*e.g.* mental retardation), this may be appropriate. In other cases, the causation may actually run the other way: that is, from low educational and occupational status, to higher exposure to health hazards, to a higher prevalence of health problems. If so, our second set of cost estimates will be on the high side.

Future research directions on morbidity costs

The morbidity cost estimates presented here, along with additional analyses of the HIS data and comparisons with other studies, suggest the following conclusions and future research issues:

1. Debility cost is a major component of morbidity costs for noninstitutionalized males age 17-64, although it has been omitted from most comprehensive COI studies.

2. Earnings loss estimates for persons unable to work based on the HIS prevalence data are considerably larger than earnings loss estimates based on U.S. Department of Labor prevalence data. The difference between HIS and Department of Labor data on numbers of persons unable to work should be investigated, since it has a substantial impact on estimated morbidity costs.

3. Allowing for health problem impacts on education and occupation increased morbidity costs for noninstitutionalized males age 17-64 by about 25 percent. Most of this increase is in the debility cost component, which rose by almost 60 percent. Our findings suggest that this increase in debility costs is relatively greater for nonwhites. In terms of future research, the impact of health problems on education and occupation should be examined in more detail. This would help to determine whether or not to control for education and occupation in estimating morbidity costs for specific types of problems. Bear in mind that in some cases the direction of causality may also come from higher exposure to health risk factors in low-level jobs (industry and occupation), owing to a lack of education. The possibility of racial differences in these impacts suggested by our results should be examined more closely.

4. Of the 61 health problem categories defined in this study, the six highest cost categories (Groups 10, 30, 47, 56, 57 and 60) account for about 25 percent of total morbidity costs.

5. Our results for the individual problem categories would not be changed substantially by alternative methods for allocating the costs of work-loss days or disabilities with multiple causes.

6. Our use of a detailed problem grouping scheme based on long-term disabilities resulted in a very uneven distribution of work-loss day costs among groups since these costs are mainly the result of acute conditions. Since increasing the number of groups could yield a more even distribution, but would also increase the variability in the estimates of our other two cost components, additional years of data may be required to deal with this problem.

7. Our estimates of costs for individual problem categories are not based on actual earnings data for people who report problems in these categories. As a result, the frequency of disabilities or work-loss days caused by each category of problems becomes the major determinant of its costs. Better data on actual earnings for people with specific problems are needed to remedy this situation. They might be obtained by adding earnings questions to the HIS.

8. A general problem with cost estimates for debility and for persons unable to work, based on cross-sectional comparisons with people with no self-reported health problems, is the possible correlation of long-term health problems with personal characteristics not captured in our earnings-prediction models. If these characteristics influence earnings, our earnings predictions will be biased; however, the use of longitudinal data sets to generate earnings predictions would mitigate this problem substantially.

Trends in disability and labor force participation: data and methods

HIS data for the years 1969-1980 on males age 17 to 64 were used to describe trends in disability and labor force participation. One specific issue addressed here is the extent to which observed trends in disability reflect actual differences in prevalence of health problems rather than individuals' responses to changing economic conditions. A second issue is the extent to which observed trends in disability prevalence can account for changes in labor participation rates.

HIS data on labor force participation and disability were used to compute estimated rates for each year in the 1969-1980 period for 10 race-age categories (white *vs.* nonwhite; 17-24, 25-34, 35-44, 45-54, 55-64). Disability rates were estimated for three levels of severity: unable to perform major activity (*i.e.* work), limited in amount or kind of major activity and limited in outside activities. In addition, the HIS labor force participation data were compared to similar data from the U.S. Bureau of Labor Statistics; time trends in participation rates from both sources were found to be quite comparable.

Empirical findings

For all males age 17 to 64, the proportion of persons unable to work and the proportion of persons limited in outside activities increased from 1969 to the mid-1970s for both whites and nonwhites and showed no clear trends thereafter. The percent limited in amount or kind of work tended to decline for whites but rose for nonwhites from 1969 to 1973 before declining. Evidence of an upward trend in disability prevalence was much stronger for the two oldest age groups (45-54 and 55-64). Since these groups showed the largest decline in labor force participation rates, a more detailed examination of their data was carried out.

More specifically, the magnitude of the increase in disability prevalence for these age groups was compared to the magnitude of the decline in their labor force participation rates (Table 4). The fact that the former was considerably smaller, especially for the 55-64 age group, implied that other factors besides reported disability prevalence had contributed to their declining labor force participation rates. This was confirmed by HIS data showing an increase in the percent of males in this age group who had retired for reasons other than poor health.

To examine the possibility that the rise in reported disability prevalence was due to an actual increase in health problem prevalence, published HIS data on problem prevalence was compared for 1968-1971 and 1975-1977. These data showed a modest increase in prevalence for a number of types of chronic conditions including,

in particular, musculo-skeletal problems. However, the magnitude of the increase was less than the increase in reported disability prevalence.

Conclusions

In summary, the descriptive data from the HIS support the following conclusions:

1. The HIS labor-force participation data for the 1969-1980 are comparable to the BLS data and indicate a decline in the labor-force participation rates for working age males. This decline is largest for older males and for nonwhites.

2. The increase in disability prevalence is closely correlated over this period with the decline in labor-force participation, but the magnitude of this increase leaves an important portion of the labor-force participation decline "unexplained" by health problems or disability.

3. HIS data on reasons for retirement among older males confirm that reasons other than poor health have been important causes of declining labor-force participation.

4. The increase in the prevalence of low-severity disabilities in the period from 1969 to the mid-1970s for older males, along with the absence of a clear shift in the disability distribution toward more severe levels over this period, suggests that the increased overall rates of disability were not due solely to a response to changing economic incentives. HIS prevalence data on chronic conditions and impairments (rather than disabilities) support this contention.

5. The evidence of a shift in the disability distribution in the latter part of the study period, however, along with the much weaker evidence of such a shift in the period from 1969 to the mid-1970s, is consistent with the hypotheses that changes in economic incentives do have some impact on reported disability data and hence on national morbidity cost estimates based on these data.

Table 1. Group numbers of health problems for which morbidity cost estimates were obtained.

1. Blindness
2. Visual impairment, other
3. Other sensory impairment
4. Mental deficiency
5. Loss of more than 1 limb or digits
6. Loss of lung, kidney, bone, joint, muscle, extremity intact
7. Paralysis—upper or lower extremity, fingers or toes
8. Paralysis—para-, hemi-, or quadriplegia
9. Cerebral palsy, partial paralysis, any site
10. Orthopedic impairment, neck, back/spine/vertebrae
11. Orthopedic impairment, neck, arms/hands
12. Orthopedic impairment, hip/pelvis with any other site
13. Orthopedic impairment, knee, leg, ankle, foot
14. Nonparalytic orthopedic impairment, multiple sites (except as in Groups 10-13), ill-defined
15. Deformity of limbs, trunk, back, not elsewhere classified
16. Infective and parasitic diseases
17. Neoplasms
18. Endocrine, nutritional, metabolic and blood disorders
19. Diabetes (mellitus)
20. Psychosis (schizophrenia)
21. Psychosis (non-schizophrenic)
22. Neurosis
23. Personality and other nonpsychotic disorders
24. Alcoholism and nonspecific nervous disorders
25. Multiple sclerosis, paralysis agitans
26. Epilepsy
27. Other nervous system disorders
28. Eye and ear diseases
29. Chronic ischemic heart disease with hypertension, angina with hypertension
30. Chronic ischemic heart disease without hypertension
31. Acute myocardial infarction, angina pectoris without hypertension
32. Any rheumatic condition
33. Heart-fibrillation/tachycardia/arrhythmia
34. Heart-failure/stop/blockage
35. Heart disease, not otherwise specified
36. Heart trouble, ill-defined
37. Hypertensive heart disease, not elsewhere classified, nonmalignant
38. Hypertensive disease, not elsewhere classified
39. Cerebro-vascular disease with benign hypertension
40. Cerebrovascular with no hypertension, with arteriosclerosis
41. Cerebrovascular disease, not otherwise specified
42. Arterial disease
43. Venous disease
44. General circulatory conditions
45. Emphysema
46. Asthma
47. Other respiratory diseases
48. Liver diseases
49. Stomach-duodenal ulcer
50. Abdominal cavity hernia
51. Other diseases of digestive system, not otherwise specified
52. Genito-urinary disorders
53. Diseases of skin/subcutaneous tissue
54. Rheumatoid arthritis and allied conditions
55. Traumatic and osteoarthritis
56. Nonspecific, nontraumatic arthritis

57. Displacement intervertebral disc
58. Other musculoskeletal, connective tissue diseases
59. Congential and ill-defined conditions
60. Injuries
61. Complications of surgical procedures

Table 2. Estimated annual frequencies of health problems by selected problem categories (frequencies in thousands).

Group	Category	Number of persons unable to work	Number of work-loss days	Number of working persons with long-term health problems
10	Orthopedic impairment: neck, back/spine/vertebrae	120.5	4043.9	521.1
13	Orthopedic impairment: knee, leg, ankle, foot	73.2	2266.9	362.5
15	Deformity of limbs, trunk, back, not elsewhere classified	54.3	558.6	213.6
30	Chronic ischemic heart disease, without hypertension	140.5	3265.7	198.6
36	Heart trouble, ill-defined	132.6	2302.6	150.6
46	Asthma	30.7	819.2	196.0
47	Other respiratory diseases	61.3	66,712.5	138.4
56	Nonspecific, nontraumatic arthritis	155.2	2680.6	257.3
57	Displacement intervertebral disc	114.2	6024.3	338.7
60	Injuries	20.2	60,702.4	41.5
TOTAL		**2,709.1**	**272,035.0**	**5,416.1**

Table 3. Estimated annual morbidity costs in 1975 dollars: selected problem categories (dollars in thousands).

Group	Problem category	Earnings losses for persons unable to work	Productivity losses due to work-loss days	Debility costs	Total morbidity costs
10	Orthopedic impairment: neck, back/spine/vertebrae	1,203,663	148,545	1,254,460	2,606,668
30	Chronic ischemic heart disease, without hypertension	1,704,124	156,877	540,775	2,401,776
47	Other respiratory diseases	581,666	2,771,879	301,476	3,655,021
56	Nonspecific, nontraumatic arthritis	1,580,109	100,751	691,399	2,372,259
57	Displacement intervertebral disc	1,218,092	249,832	1,035,127	2,503,051
60	Injuries	176,765	2,276,594	85,279	2,538,638
62	Reported work-loss days on person's record, but no conditions data	—	2,439,915	—	2,439,915
TOTAL		**28,126,225**	**11,046,425**	**12,698,433**	**51,871,083**

Table 4. Change in labor force participation and disability percentages for older, working-age males.

	1969/1976	1969/1978	1969/1980	1970/1976	1970/1978	1970/1980
White, 45-54						
Labor force participation	−1.88	−2.69	−1.80	−2.16	−2.97	−2.08
Unable to work	1.46	1.36	1.58	1.57	1.47	1.69
Any reported disability	2.55	1.63	1.95	3.21	2.29	2.61
Nonwhite, 45-54						
Labor force participation	−7.62	−1.25	−8.17	−8.58	−2.21	−9.13
Unable to work	3.63	−0.97	4.91	3.71	−0.89	−4.99
Any reported disability	6.92	1.13	3.49	5.60	−0.19	2.17
White, 55-64						
Labor force participation	−8.60	−9.12	−10.02	−7.37	−7.89	−9.79
Unable to work	3.33	4.08	4.56	2.66	3.41	3.89
Any reported disability	5.50	4.51	6.09	3.38	2.39	3.97
Nonwhite, 55-64						
Labor force participation	−14.06	−14.46	−20.27	−12.46	−12.86	−18.67
Unable to work	6.37	8.50	6.87	5.56	7.69	6.06
Any reported disability	8.37	13.41	9.54	3.90	8.94	5.07

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16. Abstract (Limit: 200 words)

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NCHSR publication of research findings does not necessarily represent approval or official endorsement by the National Center for Health Services Research and Health Care Technology Assessment or the U.S. Department of Health and Human Services.

Herbert Traxler, NCHSR Project Officer 301/443-6990

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